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(AIRMICS)

FORSCOM DSS STUDY

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October, 1988

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This research was sponsored by the Army Institute for Research in Management Information, Communications, and Computer Sciences (AIRMICS), the RDTE organization of the U.S. Army Information Systems Engineering Command (USAISEC). The purpose of this research was to provide planning guidance and specific recommendations on how Decision Support Systems can be implemented at HQ FORSCOM. This research report is not to be construed as an official Army position, unless so designated by other authorized documents. Material included herein is approved for public release, distribution unlimited. Not protected by copyright laws.

THIS REPORT HAS BEEN REVIEWED AND IS APPROVED

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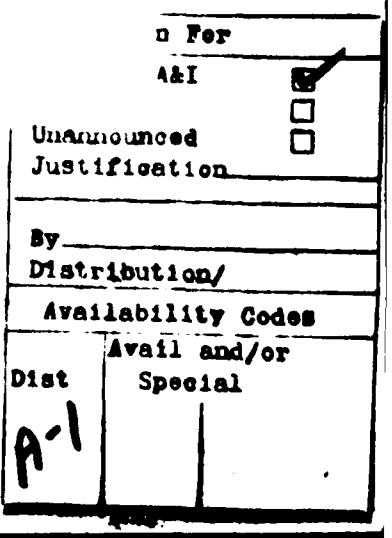

FORSCOM DSS STUDY
Final Technical Report

on Contract

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HQ FORSCOM DSS STUDY

Prepared for

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The opinions contained in this study are those of the authors and should not be construed as an official Department of the Army or Headquarters U.S Forces Command (FORSCOM) position, policy, or decision, unless so designated by other official documentation.

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ABSTRACT

The Headquarters, U.S Forces Command (HQ FORSCOM) Decision Support System(s) (DSS) Study provides planning guidance and specific recommendations on how DSS can be implemented at HQ FORSCOM. This study includes an evaluation and comparison of the automation environments at Headquarters Department of the Army (HQDA) and HQ FORSCOM and specifically discusses how the FORSCOM Information System (FIS) can achieve comparable functionality with the HQDA DSS.

1.0 INTRODUCTION

This study is divided into two main areas: a description of the current situation and a plan describing recommendations for HQ FORSCOM DSS implementation. The situation description begins with general descriptions of HQDA and HQ FORSCOM followed by more specific comparisons. The systems, environments and capabilities are analyzed and serve as a basis for generating alternatives and recommendations. The plan portion is divided into three sections: a near term plan, a FORSCOM unique alternative section and strategic planning guidance.

1.1 GENERAL

Georgia Tech Research Institute (GTRI) was tasked by FORSCOM and AIRMICS to conduct a 90 day study of the Headquarters Department of the Army (HQDA) and Headquarters U.S. Forces Command (HQ FORSCOM) data automation and decision support system environments. The purpose was to evaluate the existing HQDA DSS environment for applicability to HQ FORSCOM and to provide recommendations in the form of a plan on how similar capability can be implemented at HQ FORSCOM.

The study included a visit to HQDA to investigate the hardware, software, database and communications capabilities. Subsequent to this visit, GTRI met with HQ FORSCOM personnel on numerous occasions. The functionality of the FIS was compared with that known to exist at HQDA. The study used a single representative functional area as a focal point for evaluation. This allowed in-depth analysis so that an appropriate level of detail could be obtained for making specific recommendations. The assumption was made that the specific information gathered in one area would generate planning guidance applicable to the entire headquarters.

The representative functional area selected was the budget portion of the FORSCOM J8 Directorate of Resource Management. This area was selected for the following reasons:

a. Data supporting the FORSCOM Automated Program and Budget System (FAPABS) had already been formatted for the FORSCOM Command Database.

b. HQDA had already implemented its Budget Management Information System (BMIS), which allowed detailed comparisons of capabilities.

c. The capabilities and functionality of the HQDA DSS were recognized by FORSCOM J8 personnel as having applicability to the decision process within the directorate.

d. The FORSCOM J8 fully supported the project and was willing to provide knowledgeable personnel to assist in the analysis.

Deliverables under this project included a task schedule, work plan and the FORSCOM DSS Study. HQ FORSCOM also requested a draft copy of the study for review and comment. A formal presentation on the findings and recommendations in addition to the deliverables, was also requested.

TABLE OF CONTENTS

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2.0 SITUATION

2.1 HQDA SITUATION

The headquarters of the Department of the Army (HQDA) has developed decision support system capabilities used throughout the DA staff to aid the decision process, depict activities, and provide recommendations. The system is characterized by its current capability, the DSS development environment, and a continually evolving DSS capability. These three characteristics are described in the following paragraphs.

2.1.1 Current Capability

The current capabilities of the HQDA DSS include the ability to evaluate data, and construct graphs and charts. This capability is used to depict interrelationships and trends. This DSS is a valuable tool for action officers in their preparation of briefings and reports. Other capabilities include a mail box, calendar and other features of the professional office system (PROFS).

2.1.2 DSS Development Environment

One key to the success of the HQDA DSS is the environment in which the system exists, is maintained, and within which new applications are developed. The DA system environment has evolved over time. What began as a database manipulation and query system for DCSPER (Project FORECAST) has grown into the current development environment. This did not occur overnight and was the result of the direction and support from the highest levels within HQDA.

Substantial changes were made in the organizational focus at HQDA. Some reorganization occurred subsequent to the Vice Chief of Staff of the Army (VCSA) initiative in 1985. One initiative was to improve information management and decision system support throughout the headquarters. This established Decision System Management Offices (DSMOs) in each Army Staff Agency to complement their existing Information Management Officer. The U.S Army Decision Systems Management Agency (DSMA) was formed in 1986 using resources from the FORECAST office to provide a Decision System Management Office at OCSA level.

DSMA changed from the role of developer to the role of integrator and keeper of the environment. Functions under the commander DSMA include:

- Computer operations
- Training
- Database Administration
- Systems Engineering
- Systems Security
- Applications Software Management
- Plans and Architecture

DSMA provides the support environment used by the DSMOs under each Deputy Chief of Staff. The DSMOs are in turn responsible for the planning and execution of the specific applications packages. Some of the functions under the DSMO cells include:

- Develop general and specific plans for their functional area.
- Applications Software and DSS Development
- Contract Monitoring
- System Maintenance
- Applications Software Training

Each DSMO establishes requirements and is responsible for every aspect of an application including documentation, upgrades, and life cycle management. When a new software application is implemented, it is developed according to standards, guidelines, and procedures set by DSMA.

The HQDA environment can also be described in the following manner:

- Mature Environment. The system origins can be traced back over 12 years and reflect many lessons learned over time.

- Well Staffed. The DSMA has over 13 persons assigned full time. The DSMO at ODCSLOG has 9 military and civilian slots. These numbers do not reflect the contractor support.

- Well Funded. According to the "Vision" briefing, (see reference 5) between $45 and $50 million has been spent for software development over the last 12 years. DSMO at ODCSLOG is budgeted at approximately $2.5 million per year in accord with the DSMA master plan.

- Well Documented. Both planning and execution guidance are well documented and updated regularly.

- Well Supported. The HQDA DSS program is supported by the VCSA and other senior leadership in the Pentagon.

2.1.3 Evolving DSS Capability

The capabilities within HQDA for decision support are not limited to the database retrieval and graphic display capabilities mentioned in section 2.1.1. The HQDA plan provides for future implementation of emerging capabilities and technologies in light of the Army's mission. HQDA recognizes that this system (consisting of PL/1, Data Management System, and Virtual Machine Operating System) does not provide for capturing the power of personal computers. The HQDA plan is time-phased to allow the incorporation of programming and database access languages which will enable mainframe applications to be moved to mini computers and PCs. The HQDA plan has a strategic focus and is revised as requirements and technology change.

Current DSMA and ODCSLOG plans call for future implementation of distributed databases, transportable software, and enhanced interfaces for ease of use. Their plan also considers ease of training, and the application of technologies such as Artificial Intelligence to their missions.

2.2 HQ FORSCOM SITUATION

The Headquarters U.S. Forces Command has developed the FORSCOM Information System (FIS) which, along with the databases on the installation mainframe, provides the basic environment to meet the current and emerging needs for information management. The concept, as stated in the J6 FIS briefing, is as follows:

> "The FIS concept is a total integration of text processing, time management, document distribution, formal and informal electronic mail, graphics, spreadsheet, interactive data processing, and access to systems such as ASIMS, DDN, and other standard Army systems provided by the Information Systems Command."

The FIS can be characterized in terms of its current capability and its potential for implementation of DSS.

2.2.1. Current Capability

The current capabilities of the HQ FORSCOM environment include the ability to retrieve data files from a command database (over separate classified and unclassified networks), plus a set of commercial packages to provide word processing, spreadsheet analysis, graphics and database manipulation. These packages are accessed through a system menu that also links to the PROFS system.

From a DSS perspective the FIS is a system in an early stage of growth and is several years away from reaching its potential to aid the FORSCOM action officers and senior decision makers in meeting the command mission objectives. It is currently estimated by FORSCOM that full implementation of the Command Data Base alone will take five years. Although many pieces of the system will not be completed for some time, a basic foundation exists upon which Decision Support Systems can be implemented.

2.2.2 Growth Potential

HQ FORSCOM has its own information management goals and vision for the future. Some of these are expressed as requirements in the J6 FIS briefing as follows:

- Office information sharing
- Document processing
- Information transfer
- Terminal for each work station
- Decision support software
- Administrative support
- Modular/future growth
- Data access and development
- Security
- Database access
- Query/report generation
- Total protocol compatibility
- Friendly language
- Least disruptive
- Full support
- Maintenance
- Education and training
- Documentation
- Highly reliable

HQ FORSCOM has a vision of the future and a system concept that includes a well defined database concept. Detailed plans and preparations for the implementation of the Command Data Base are being executed. Other initiatives are underway to implement DSS and other utilities to assist end users in their jobs.

2.2.3 Unique FORSCOM Characteristics

FORSCOM has subordinate organizational relationships and situations that have no direct counterpart at HQDA. These are the Continental U.S. Armies (CONUSAs) and the FORSCOM installations. Also, HQ FORSCOM operates on numerous systems in contrast to HQDA's primary single system. The characteristics of the CONUSAs, installations, and mainframe/workstation utilization are discussed separately in the following paragraphs.

2.2.3.1 CONUSA Characteristics

Each CONUSA HQ has a Wang VS100 running the VS operating system. FORSCOM also possesses a Wang VS100 that interfaces with the CONUSAs. The Wang systems are independent of FIS and the installation host systems.

Since all CONUSA computer systems have the same general configuration, any software developed for a CONUSA (or FORSCOM Wang system) can be physically transferred to others easily, without significant modification. Software developed for the IBM systems of the FIS would require significant modification to run on the CONUSA Wang systems. The cost/benefit of porting such applications from the FIS to the CONUSA would have to be determined on an application-by-application basis.

If the application is deemed suitable, other considerations must be examined. Porting of any general application available to HQ FORSCOM to each CONUSA must first be in compliance with restrictions placed on all reserve components of the CONUSA. The program manager for the Reserve Component Automation System (RCAS) has dictated that no hardware, software, or communications capability is to be added to the RCAS system. RCAS is currently scheduled for fielding in the early 1990s. Automation support to the CONUSAs would be constrained to only the active components and not to the Major U.S. Army Reserve Components (MUSARC).

2.2.3.2 Installation Characteristics

Installations generally have an IBM 43xx series system to interface with the ASIMS (VIABLE) system and an IBM 43xx series system to provide host functions (similar to those performed by the host processor at HQ FORSCOM). Currently, the installations use an assortment of operating systems, including MVS, VM, and DOS/VSE. General software functions such as databases also vary from installation to installation. In addition, the usage of PCs as terminals varies widely.

Users at the installation level can interface with other installations via ASIMS. FIS users can also interface with the installations using ASIMS and the distributed processors. Data can be acquired from ASIMS, reworked locally and then stored on the host system (or vice versa), at both the installations and HQ FORSCOM.

2.2.3.3 Mainframe/Workstation Utilization

The FIS was designed to provide office automation and services for decision makers, action officers and secretaries. Personal computers are utilized as user workstations allowing the accomplishment of many tasks locally, without requiring the use of other systems. The host mainframe provides access to the CDB. Users can download data to the workstation and manipulate it off-line, although data queries can be performed on the mainframe with the workstation acting as a dumb terminal.

2.3 SITUATION COMPARISON - HQDA DSS and HQ FORSCOM FIS

2.3.1 Hardware Situation

The hardware situation comparison is divided into three parts: host processor, distributed processor and workstation. The operating systems and network configuration are discussed in this section since they relate more to hardware function and performance than to user applications.

2.3.1.1 Host Processor

This section provides a brief description of the HQDA DSS host processor system as contrasted to the HQ FORSCOM host processor system. Basically, there is little difference between these systems. Both HQDA and HQ FORSCOM use the IBM 30xx series mainframe computers as their host system. HQDA uses its host for all mainframe user functions (such as the DSS), while FORSCOM utilizes its host as a hub to connect to distributed processors and to perform some mainframe user functions (such as the Command Data Base).

The operating systems used by the host systems at HQDA and FORSCOM are different; HQDA DSS uses the VM operating system, while HQ FORSCOM uses the MVS operating system. These operating systems provide similar functions through different methods. Therefore, there is no real difference in what the user can potentially perform.

Action officers and senior decision makers interviewed at FORSCOM expressed a desire to view data that HQDA is using to make decisions directly affecting FORSCOM. The ability to update this data, or at least request changes, would be an added benefit. As of 14 October 1988, there were 72 FORSCOM users on the HQDA DSS. These users appear to use their system privileges primarily for electronic mail.

The capability to access the HQDA DSS system already exists on the FIS. The FIS user accesses the HQDA DSS through the AMSNET/FORECAST subsystem of the External Systems item on the main FIS menu (the FIS user can also gain access via the modem pool). Unfortunately, the current configuration of the network excludes the use of graphics transmitted from the HQDA DSS. Some of the HQDA database

applications require graphics capabilities to view data. Since the graphics capabilities are one of the major strong points of the HQDA DSS, the lack of graphics minimizes the usefulness of the DA DSS from a FIS workstation.

The HQDA host processor has been carefully configured to optimally fulfill DA needs. New system functions and applications are added based on established procedures to provide the best performance. The host processor at FORSCOM has not been configured this way. New system functions and applications are added without regard to system performance. As a result, the system cannot easily support new functions under the current configuration. System throughput does not conform to the machine potential. The primary reason for this is the lack of fine-tuning of the host processor.

2.3.1.2 Distributed Processors

HQ FORSCOM makes use of a number of different distributed processors; something HQDA cannot do. In the sense of the FIS, the HQDA host system could be viewed as being both the host processor and distributed processor. From that perspective, HQ FORSCOM has a large functional advantage. HQDA has one system to provide mainframe database access, electronic mail and other support functions. HQ FORSCOM is able to distribute this workload, providing a more robust system. When the HQDA system goes down all users must wait until the system comes back on line. With the multiple systems at FORSCOM, if a distributed processor goes down other systems are still on line. This allows other users to continue work on systems that are not effected.

Multiple systems allow the use of multiple operating systems. HQ FORSCOM currently runs three operating systems on the host and distributed processors: VM, MVS and DOS/VSE. These provide the ability to run virtually any mainframe software package. In contrast, the entire HQDA system runs under the VM operating system.

2.3.1.3 Workstations

Both HQDA and HQ FORSCOM make use of personal computers as the primary user workstation. This provides users with the computational power to perform

many functions locally without burdening the mainframe systems. The use of PCs allows the user to continue to solve problems even when the link to the host system is unavailable. In addition, users can perform many office tasks, such as word processing, spreadsheets, and generation of briefing materials, with nothing more than the system on their desk. The main difference between the HQDA and HQ FORSCOM local processors is the use of a fixed hard disk at HQDA as opposed to the removable disk pack at HQ FORSCOM. Both locations use the DOS operating system.

2.3.2 Software Situation

This section describes the software situation at HQDA and HQ FORSCOM, including system utilities and user applications. This section is divided into host processor, distributed processor, and workstation software. There is some overlap due to differences in configuration between HQDA and HQ FORSCOM systems.

2.3.2.1 Host Processor

Many HQDA DSS applications integrate graphics with database information. This graphics capability is provided by the Graphical Data Display Manager (GDDM) utility on the host processor. Each application handles its own graphics using GDDM, based on DSMA-defined interface standards. HQ FORSCOM does not use graphics in conjuction with database information. GDDM is installed on the IBM 4361 distributed processor running the DOS/VSE operating system. There is a graphics display manager enhancement with the FORTRAN compiler on the host processor, but it is not currently used with the database.

HQDA has implemented most of their existing software using the PL/1 programming language. However, Cross System Product (CSP) will be used for all new software. HQ FORSCOM has software written in COBOL, FORTRAN, ROSCOE and SLAM II on the host processor.

2.3.2.2 Distributed Processors

HQDA does not use distributed processors. Access to the HQ FORSCOM distributed processor software is provided automatically through the FIS menu structure. The FIS distributed processors have a number of tools comparable to those on the HQDA DSS host. HQDA uses PROFS for electronic mail and data communication, as does HQ FORSCOM. CSP is implemented on the FIS 4361 distributed processor. This processor is used for installation tasks and is separate from the CDB. This distributed processor also has GDDM, although applications using these tools do not appear to be in general use as they are at HQDA.

2.3.2.3 Workstations

Both HQDA DSS and the FIS utilize menus extensively. HQDA implements the menu system on the mainframe while HQ FORSCOM uses the workstation. HQDA does not include any PC functions in the menu. Both locations use dBase III extensively for local processing of database information. HQDA allows the use of a command line to go directly to an application, without the use of menus. They have also standardized the user interface to be used for all applications. This ensures that tasks (such as data transfer, printing, exiting the program, etc.) are accomplished identically in all applications.

HQDA DSS utilizes a jump key to allow the user to switch between mainframe and PC tasks. This allows the user to initiate a task on the host system and jump to the PC session while the task completes. The FIS does not have this switch capability.

2.3.3 Database Situation

2.3.3.1 HQDA DSS

From a database standpoint, HQDA DSS is well-structured. Within DSMA there are database administrators, an integrated database team, data administrators and a database coordinator for each project. Each has specific responsibilities and functions.

SQL/DS is the standard DBMS (Data Base Management System). Data is primarily accessed through applications selected from menus. Within an application, the user generally has three options for viewing and extracting data: menus, SQL queries and Intellect. The simplest to use is the menu approach. The "menus" are contractor developed software packages that embed text and graphics for ease of access to frequently requested data in a pre-defined format. Training time to use the menu options is mimimal. SQL queries and Intellect, on the other hand, are used when the user desires a format not provided by the menus. Both allow command line input for data queries. SQL is a technical computer language for experienced users. Intellect is a natural language interface developed by the Artificial Intelligence Corporation. Intellect allows the user to access data using common English words. This method of data query is fairly simple to learn and easy to use. Intellect also has built-in graphics and printout support. Thus, users may extract, print and graphically display data from within one integrated package.

2.3.3.2 HQ FORSCOM

The FORSCOM Information System (FIS) handles large amounts of data which are stored in multiple files. These files are being evaluated and combined into several large files. The goal is to refine the data elements so that there will ultimately be one data source, the Command Data Base (CDB). This process is defined and constrained by the Information Architecture Model (IAM) which provides a means of mapping the relationship between every element of the FIS. The IAM is a powerful planning tool.

The FIS currently has multiple software packages for data querying and extraction. These include Datacom, Data Query and Data Reporter, which are products of Applied Data Research, Inc. (ADR). In general, these programs allow users to create and process queries and then view the results either onscreen or as a printout. Most of the data resides or originates at the mainframe level.

At the PC level, the FIS provides the user with LOTUS 1-2-3 (product of Lotus Corp), dBase III Plus (product of Ashton-Tate) and Microsoft Windows (product of Microsoft). Graphics support is primarily obtained from Windows and LOTUS.

Users can import extracted data into these programs and manipulate it further as charts and graphs if necessary.

2.3.3.3 Comparative Example - Database Situation

To illustrate how similar functions can be performed using the current HQDA and FIS systems, a comparative example is given. Figure 2.1 diagrams the steps a user would take on each system when their objective is to produce a report, complete with graphics. On the HQDA DSS, the user has the ability to go directly from the initial menu to a specific application such as BMIS. After two additional menu selections, the user may execute data queries, display graphics and print hard copies.

There are no graphics capabilities embedded within or accessible from the data extraction software on the FIS. Therefore, the procedure for accessing graphics has more steps. To attain graphics, the user must download data from the mainframe to their PC and then pull the data into Lotus, Windows or some other graphics package. To download data, the user must go through four menu levels before specifying a data file and extracting data. Then, the user must back out of PC Datacom and access the graphics software. In addition, the user often uses dBase III to format and/or manipulate the data prior to producing the graphics. Overall, the FIS user has to go through many more steps.

In general, similar final products can be produced from either system. On the FIS however, the procedure is more complicated, time consuming and requires more training. This is largely because utilities which provide data extraction and graphics are accessed as separate entities. The user must become familiar not only with the operation of each utility but also with how to get to them from a system menu or from within another utility.

The FIS can perform database functions but needs enhancements to achieve HQDA functionality. The FIS allows data access from the CDB, but has little of the ease of use of the DA system. HQ FORSCOM does not have similar functionality with the DA system in the following areas : menu queries with embedded modules for text or graphics output, the ability to access data through a structured query language from a command line rather than through a menu scheme, and the ability to request data in the form of text or graphics using a natural language interface.

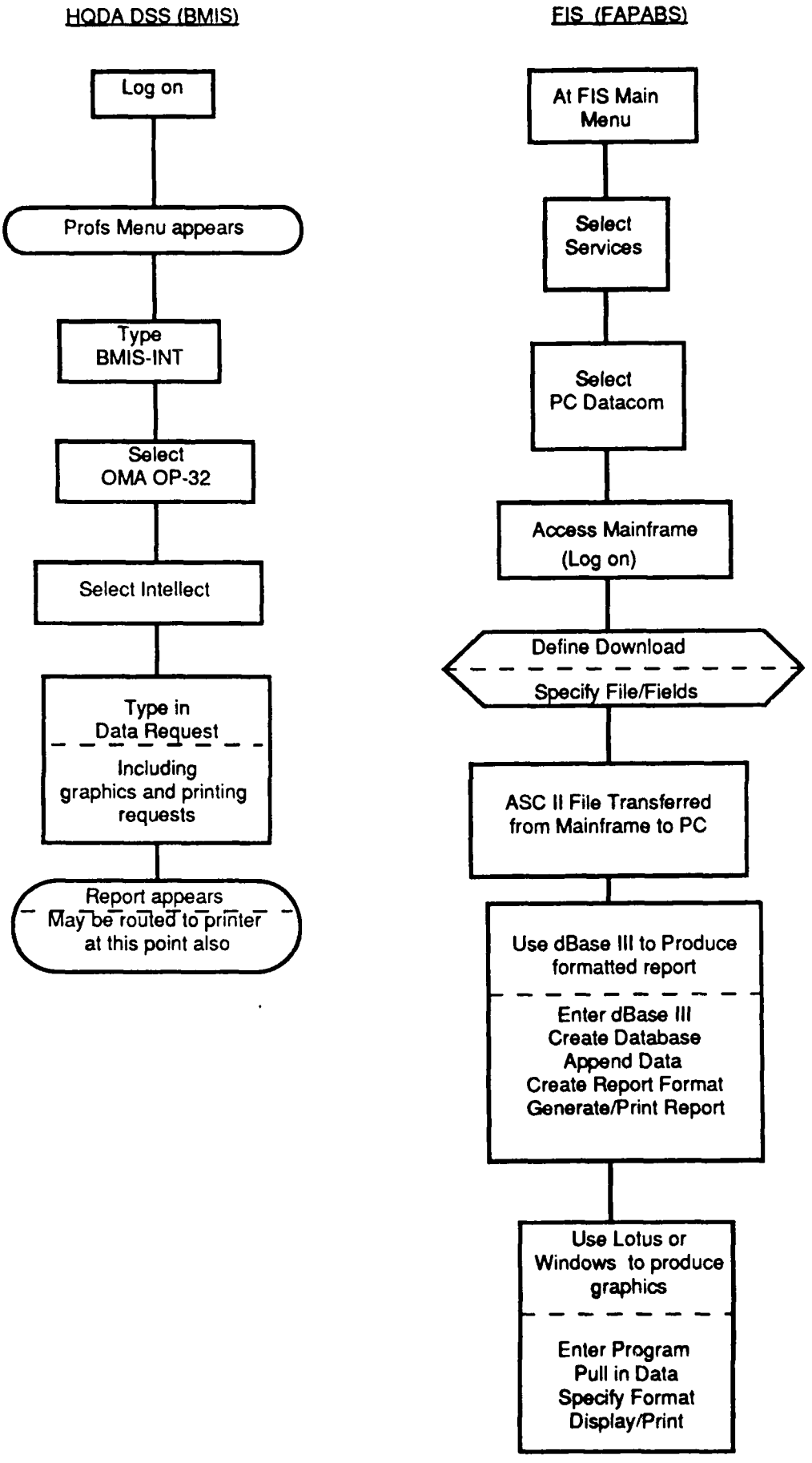

HQDA DSS (BMIS)
Log on
Profs Menu appears
Type
BMIS-INT
Select
OMA OP-32
Select Intellect
Type in
Data Request
Including
graphics and printing
requests
Report appears
May be routed to printer
at this point also
FIS (FAPABS)
At FIS Main
Menu
Select
Services
Select
PC Datacom
Access Mainframe
(Log on)
Define Download
Specify File/Fields
ASC II File Transferred
from Mainframe to PC
Use dBase III to Produce
formatted report
Enter dBase III
Create Database
Append Data
Create Report Format
Generate/Print Report
Use Lotus or
Windows to produce
graphics
Enter Program
Pull in Data
Specify Format
Display/Print

Figure 2.1

2.3.4 Training

Both HQDA and HQ FORSCOM provide training courses for their users. As is shown in the list below, HQDA users spend less time in trainings. They are given introductory level training in one and a half days. In contrast, FIS users spend a total of five days (ten half days) learning the basics.

HQDA

Introductory	1.5 days (action officers)
	0.5 days (executive officers)
Advanced	0.5 days (average)
Specific Application	1-3 days depending on the application

HQ FORSCOM

Application A (Profs, Multimate, Printing)	2.5 days (5 x 0.5ea)
Application B (Lotus, dBase)	2.5 days (5 x 0.5ea)
Data Transfer (PC Datacom)	2.5 days (5 x 0.5ea)
Advanced Graphics & Spreadsheet	5.0 days (10 x 0.5ea)
ADR DatacomDB	4.0 days

3.0 HQ FORSCOM DSS PLAN

The following HQ FORSCOM DSS Plan has two components: a specific, near term plan to enhance functionality in the current FIS structure, and strategic planning guidance to focus on HQ FORSCOM DSS planning for the future. Both the near term plan and the strategic planning guidance reference comparable capabilities at HQDA. Section 3.2 addresses concerns that are unique to FORSCOM.

3.1 NEAR TERM FORSCOM DSS PLAN

The near term plan consists of objectives, alternatives, recommendations and implementation guidelines. Based upon the objectives, alternatives and recommendations were selected. Guidelines are given for implementation of the recommendations which will enable FIS to achieve the basic functionality of HQDA DSS.

3.1.1 Near Term Objectives

The near term objectives for the FORSCOM DSS are derived from three sources:

1. The implied objectives in the FORSCOM DSS Statement of Work.
2. The comparison between the FIS and the HQDA DSS functionalities.
3. The necessity for creating a DSS environment foundation at least functionally comparable to the HQDA DSS.

All of the objectives are directly related to improving the job performance of the typical HQ FORSCOM action officer. The objectives taken together will provide a solid foundation for creating a DSS environment. They also establish the general framework for the FIS's comparable functionality vis-a-vis the HQDA DSS. The below stated objectives are not constrained by current technology or particular idiosyncracies of the HQ FORSCOM environment. They track solely on the perceived needs of the FIS user.

The near term objectives for the FORSCOM DSS fall into three general areas with respect to the user: Speed, Ease, and Effectiveness.

Speed objectives:

1. The rapid display of decision information on activity status, trends and interrelationships in data or graphic form.
2. Significantly faster automated preparation---as compared with manual methods---of recommendations, reports, briefings and slides.
3. Information transferred within seconds among user work stations or between the user and the FIS.
4. User receives adequate training for general system operation in two days.

Ease objectives:

1. Task requests are intuitive with simple human initiation and minimal human-to-machine interaction.
2. Human-to-machine interactions occur up-front with time-intensive processes not tying up the user.
3. Movement between applications and transfer of data is simple, intuitive and transparent.
4. System user interfaces are consistent, intuitive and simple enough to promote progressive independent learning.

Effectiveness objectives:

1 Outputs focus on decision assistance for decision makers: slides, briefings, charts, correspondence, and messages.
2. Information is easily transferred between users, and between user and the FIS.
3. Different types of information (ie., words, graphs, spreadsheets) are readily merged and blended in any output medium.
4. Training focuses on specific action officer tasks.

3.1.2 Alternatives for Comparable Functionality

The alternative recommendations listed below are designed to facilitate the near term objectives. They establish an environment which will support future DSS modules such as the J8's future FAPABS upgrade. These recommendations also pave the way for achieving and possibly surpassing comparable functionality with the HQDA DSS.

The alternative recommendations are divided into the major categories of hardware, software, and training. The hardware and software categories are further organized along the lines of the three tier architecture when applicable. This organization meshes smoothly with the FIS's physical organization of mainframe, distributed processors, and personal microcomputers.

3.1.2.1 Recommended Hardware Alternatives

MAINFRAME:

1) Baseline and fine-tune the DOIM IBM 4381 mainframe host processor. Fine-tuning would enhance the performance of the host processor without the addition of new hardware or software. The HQ FORSCOM host processor does not perform up to the machine's capabilities. The performance gains in such areas as throughput, Central Processing Unit (CPU) utilization, and user response time should be significant. System administrators should be able to perform this baselining and fine-tuning as part of their normal function. Establishing a baseline is a prerequisite to identifying any other bottlenecks in the system.

2) Upgrade existing data link from the FIS to the HQDA DSS. This would allow easier access to DA data and provide a potential graphics capability for FIS terminals viewing HQDA DSS data. The upgrading of the network connection would expand the network's power, speed and electronic mail functionality. A FIS user must have an inexpensive software utility, such as PC-Link, to access the HQDA DSS graphics. No other hardware or software changes would be necessary. FIS users could then access HQDA DSS graphics as if they were HQDA users. Personnel

at HQDA have already been in contact with Boeing engineers about the feasibility of upgrading the network connection. They have been assured that Boeing has all the hardware, software and expertise to perform this upgrade.

3) Increase the number of phone lines into HQDA's TAPNET System for use by HQ FORSCOM. Currently this system has only four phone lines for outside users' use. Currently all of these lines are being used. HQ FORSCOM can add more lines for its use but it must fund them. Having these lines would enable graphics to be displayed along with the presently available menus and data. This would still require the use of a utility similar to PC-Link.

LOCAL WORKSTATION (PC):

A memory expansion card may be required to support possible software upgrades. This should not preclude other potential hardware upgrades as the interface evolves, i.e. pointer devices, voice recognition and optical scanners.

3.1.2.2 Recommended Software Alternatives

MAINFRAME:

1) Integrate/embed graphics capabilities into the data extraction software on the mainframe. Currently users must transfer data into a separate program on their PC to generate graphic displays. Embedded graphics could be accessed more quickly.

2) Acquire/develop a natural language interface for data extraction. The current ADR products (Dataquery, Datareporter and PC Datacom) exist as separate entities. A natural language interface tying these together would simplify data querying for the user. It would reduce the number of layers a user must traverse to get to the point where a query can be created or executed. A natural language interface allows the user to

phrase queries in plain English. This is not only easier to use but also requires less training.

PC:

1) Enhance Sessions Manager screens to decrease steps required to perform functions. Functions should also be grouped logically, and enable potential technological upgrades such as pointer devices. This can be facilitated by utilizing a human factors expert to analyze the human-computer interface.

2) Expand PC Datacom to include additional data retrieval and display functions. Such functions would include: grouping data from the mainframe and PC and displaying this data in graphical form. The transfer of data from mainframe to/from PC should be transparent to the user. The objective would be to allow the user to access the ADR database in a simple straight forward manner. These functions are currently not united under one application. Uniting several functions under one application with a single interface allows the user to concentrate on the task at hand. These functions should be implemented in a manner to minimize the load on the host machine supporting the ADR database.

3) Add a command line to Boeing's Sessions Manager software as an option to the present menu structure. Currently all users must step through a hierarchy of menus to reach a desired command. An alternative command line would allow sophisticated users to bypass the menus.

4) Develop an embedded control application to link functions through a single interface. This would simplify movement between applications, the transfer of data between applications, and the execution of common functions. This would greatly enhance the simplicity from the user's perspective. This would also reduce the complexity of performing a task since the user would be involved with only one application. Figure 3.1 compares the steps necessary to complete a sample task using the present system and a possible control application.

PRINTING MULTI-MATE FILE

Current Steps	Suggested Steps
Assumption: *Multi-Mate printer options were set previously.*	*Assumptions:* 1. *The printer options were set previously in the Session Manager printer setup. This automatically sets the printer setup in applications such as Multi-Mate.* 2. *Printing is performed through a driver so the application appears to print directly to the printer.*
• Select Applications Software option from Session Manager Main Menu.	
• Select Multi-Mate from Application Menu.	• Select Multi-Mate from Session Manager Main Menu. (Note: This gives the user easy access to those applications used most often by placing them in the top menu.)
• Perform Word Processing • Save a print file. • Exit Multi-Mate.	• Perform Word Processing. • Print file.
• Exit Session Manager Application Software Menu. • Select Print option from Main Menu. • Logon mainframe.	• Enter user name and password. (Note: This information is requested by the driver which will use this data along with the Session Manager printer setup to logon the main frame; and select the correct printer and file to be printed.)
• Select printer. (Note: User must insure that the printer matches the setting that were used in Multi-Mate.) • Print file. (Note: User must remember the file name used earlier.) • Logoff main frame. • Exit Print Menu.	

Figure 3.1

5) Redesign FIS interfaces to allow tasks to run without intermediate user supervision. Then the FIS operator could input all parameters necessary for a process to be executed. Once these parameters were entered, the process could run without intermediate user supervision.

6) Use an integrated package for the word processor, database management, spreadsheet and communications software functions of the FIS. This would give the user a unified interface across these system functions. Transferring results from a spreadsheet to a word processor document or to a database would be easier and more straightforward. This would also reduce training time.

7) Utilize the marketing clout and user experience of HQ FORSCOM to influence future releases of the off-the-shelf PC software currently used on the FIS: dBase III Plus, Lotus 1-2-3, Multimate Advantage, etc. FIS users should be able to inform the software vendor of desired changes. This would improve the chance that future off-the-self software would better meet FIS needs. This would also lessen the probability that upgrades would be detrimental to the FIS.

3.1.2.3 Training

1) Conduct individual task training based on the actual user requirements of specific users. FIS users have received adequate general instruction. However, many users are still making limited use of their systems. Training that focused on solving a particular user's specific job problem would more likely be retained. This type of training would probably be a very slow process designed to create a expanding corps of computer- and problem-competent people. A strong, well supported users group could greatly facilitate this process. Users, not just user representatives, should be encouraged and allowed to participate. A users' group electronic bulletin board would be effective in communicating needs and solutions. The creation of a DSS environment and eventually individual DSS will also simplify training.

2) Establish task response teams to assist user task accomplishment. These task response teams should be composed of a cross section of automation and section liaison/support personnel who are available to propose and develop solutions for specific user tasks. They would analyze the user's objectives; and propose and develop the best automation solution given the current resources. This technique should be contrasted with the technique of responding to tactical user problems and then proposing quick fixes that do not take into account the user's broad objectives.

3.1.3 Recommended Alternatives

After reviewing the list of available alternatives in Section 3.1.2 the following alternatives were selected as offering the best chance for achieving a comparable functionality and establishing a foundation for future DSS development. The selected alternatives are logically grouped under six major headings as listed below:

Baseline Main Frame

- Baseline and fine-tune the DOIM IBM 4381 mainframe host processor.

Enhance Application Interaction

- Develop an embedded control application to provide a set of common functions through a single interface.
- Redesign some FIS interfaces to allow tasks to run without intermediate user supervision.

Enhance Sessions Manager

- Enhance Sessions Manager screens to decrease steps required to perform functions.
- Write software to add a command line to Boeing's Sessions Manager software.

Expand Application Software Packages

- Write software to expand PC Datacom to include additional data retrieval and graphical display functions.
- Acquire/develop a natural language interface for data extraction.

Task Oriented Training

- Conduct individual task training based on specific user requirements.
- Establish task response teams to assist users.

Marketing Clout

- Utilize the marketing clout and user experience of HQ FORSCOM to influence future releases of the off-the-shelf PC software currently used on the FIS.

3.1.4 Implementation Guidelines

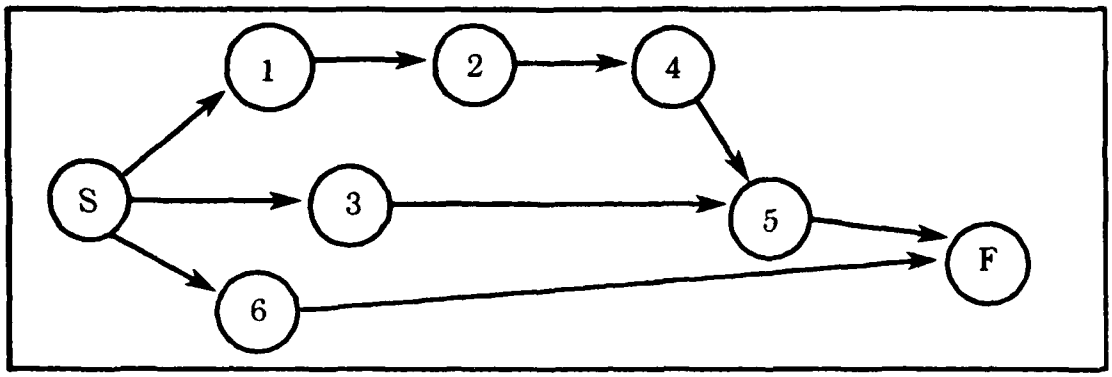
The six major recommendation categories, or milestones, are displayed in the matrix below. Depicted along beside each recommendation category is the perceived priority of the task, the estimated time to accomplish the task, and the tasks that should precede each individual task:

MILESTONES MATRIX

RECOMMENDATION CATEGORY	TIME	PRIORITY	PREDECESSORS
S Start	(Calender/months)		
1 Baseline	2	1	none
2 Enhance Application Interaction	6	2	1
3 Enhance Sessions Manager	3	3	none
4 Expand Application Software	12	4	1,2
5 Task Oriented Training (Preparation)	3	5	2,3,4
6 Marketing Clout	1	6	none
F Finish			

The recommendations' interrelationships are further depicted in the work flow diagram below:

MILESTONE WORK-FLOW DIAGRAM



The Milestone Work-Flow Diagram should not be interpreted too rigidly. The milestones' interaction and precedence may overlap or run in parallel, depending on development methodologies. The diagram should only be considered as a general guide for precedence.

The completion of all the tasks in a recommendation category should be treated as the completion of a major milestone in the achievement of the near term plan for comparable functionality with the HQDA DSS. Accordingly, the completion of all the recommendation categories would result in the achievement of the basic functionality of the HQDA DSS.

3.2 FORSCOM UNIQUE ALTERNATIVES

3.2.1 CONUSA Alternatives

Given the situation regarding the RCAS, the recommendation for the short term is not to port HQ FORSCOM applications to each CONUSA, but to provide access to the system via remote dial-in. This will require permission from the program manager for RCAS to provide network access to the FIS.

3.2.2 Installation Alternatives

Installation alternatives relate to standardization of hardware and software. These are long term goals and they are discussed in Section 3.3, Strategic Plan.

3.2.3 Mainframe/Workstation Utilization

HQ FORSCOM has several options in determining the best way to exploit the computing power that exists on site:

1) the host/distributed processors can be used for data and graphics manipulation and display,

2) small functional databases and support modules (including graphics) to allow most work to be done on the workstations, or

3) portions of the Command Data Base could be downloaded to the workstation for data and graphics manipulation.

There are advantages and disadvantages to each, which will be addressed separately.

3.2.3.1 Use of Host/Distributed Processors

HQDA DSS is implemented on a single mainframe, while the FIS has multiple mainframes that can be used. Using the FIS host or distributed processors to store, manipulate, and display data provides a simple method of creating a comparable

DSS. This would provide a configuration closest to that of the HQDA DSS. If a user is updating a data set, other users are prevented from trying to update the same data. This helps prevent data corruption. There is little chance of having multiple versions of data on the system simultaneously. The mainframes have sufficient power to support many users without difficulty. In addition, since only the mainframe is used (the workstation acts as a dumb terminal), the user only needs to learn one system.

There are drawbacks to the host/distributed processor approach. While this configuration would be the closest to that at HQDA, it is not necessarily the best for HQ FORSCOM. Mainframe software tends to be more cumbersome and harder to use than PC software when performing comparable functions. The FIS host system would slow down as more users accessed the database, and the full potential of the workstations would not be realized. As a result, HQ FORSCOM would have to add more resources, or rearrange existing ones. Additionally, depending on the system load, users would have variable response times. The response time would often be too long for the user to wait. Also, if the host system goes down, the user cannot accomplish the assigned task. Using the workstation to do some or all the work would alleviate load problems. If a workstation goes down, only the single user is affected.

Overall, the host/distributed processor approach could turn out to be the most costly solution. Since the money has been spent on the workstations, FORSCOM should take advantage of this desktop. power. As technology progresses, upgrading the workstations will be much simpler and cheaper that upgrading mainframe computers. At the current rate of technological advancement the workstation capacity will soon reach that of today's mainframe computer.

3.2.3.2 Small Functional Databases

Using the workstations to store, manipulate, and display the data is a second alternative. This utilizes the full potential of the workstation, freeing the user from problems of the mainframe computers. The number of users manipu.ating data does not affect response time; the time needed for any given calculation will be the same every time. If a system goes down, the user can simply move to another machine. The mainframe computers can be used for electronic mail and to transfer data among

installations or users on site. Given the rapid development of PC technology users will be able to gain significant improvements near term through upgrades to the workstation. Additionally, workstation applications can be made very user friendly, which is more difficult for mainframe software. Since the mainframe is not used, the user need only be knowledgeable about the workstation.

There are drawbacks to this solution as well. Now, instead of under-utilizing the workstations, as in the first alternative, the mainframe computer is under utilized. In addition, multiple users will often need to deal with the same data. Letting each workstation have its own database would almost guarantee having multiple, different copies of the same data set. Without strict data control, there would be chaos. Some users may have to deal with data sets that are too large for the standard workstation, or the manipulation may be too complex for the workstation to do in a reasonable time.

3.2.3.3 Downloading Portions of the CDB

Using the mainframe computer to store the data, while data manipulation and display take place on the workstation provides an intermediate alternative. Both mainframe and workstation computers are utilized. The user does not have to worry as much about the mainframe going down, since a portion of the database will already be on the workstation. If the workstation goes down, the user can transfer the small database to another workstation. If the user must deal with large data sets or very complex data manipulation, the capability should exist for the user to access the mainframe to do the task. Computer response time will remain stable. Modified data is uploaded to the mainframe system, so that other users will be able to access this updated information. As mentioned previously, workstation applications can be made very user friendly, which is more difficult for mainframe software.

There are drawbacks to this solution as well. It is still probable that multiple users will need to access and manipulate the same data. Proper data administration is required to ensure date integrity. Additionally, since both computer systems are used, the user will need to be familiar with the workstation application and know how to upload and download data.

3.2.3.4 Summary

Under alternative one, the host/distributed processors can be used for data and graphics manipulation and display. Alternative two incorporates small functional databases and support modules (including graphics) to allow most work to be done on the workstations. Alternative three allows portions of the Command Data Base could be downloaded to the workstation for data and graphics manipulation.

The possibility of data corruption is greatest under alternative one. Alternative two provides the best data safety.

The best distribution of work is provided by alternative three sharing work between the workstations and mainframe computers. Alternatives one and two do not distribute work properly.

Alternative two provides independence from mainframe failures. Alternative three alleviates part of the problem. Total dependence on the mainframe, as in alternative one, can result in massive delays and uncompleted tasks due to system failure.

In terms of easy-to-use applications, either of the alternatives employing the workstation to manipulate the data is preferable to using the mainframe.

Since the second alternative accesses both systems, the user must have at least minimal knowledge of both the mainframe and workstation computers. The other alternatives only require knowledge of one system.

In general, the third alternative (downloading portions of the database) would have to be given a higher rating. The potential for user-friendly operation will minimize training time. The requirement of having knowledge of both systems can be minimized with user-friendly software on the workstation. Insulation from mainframe problems also saves the user from either not getting the job done or having to kill time until work can be finished. Advancements in PC software and hardware are certain to provide capabilities equal or superior to today's mainframes in the near future. The other alternatives would rate about even.

3.3 STRATEGIC PLANNING GUIDANCE

FORSCOM needs a strategic plan to provide direction and guidance for implementation of DSS throughout the command. Command goals and strategic planning exist for many of the system components as described in Section 2.2. A plan is needed that consolidates existing guidance with a focus on creation of a DSS development environment and addresses the technologies supporting the FORSCOM mission. The plan should cover a period of for five to eight years into the future. This section provides general and specific guidance for creation of that plan.

3.3.1 Strategic Objectives for DSS Implementation

These strategic objectives for the FORSCOM DSS study are derived from the following sources.

1) The implied objectives based on the task descriptions from the FORSCOM DSS Study Statement of Work.

2) A comparison between the environments at HQDA and at HQ FORSCOM.

3) Assessment of the impact on FORSCOM of other DSS efforts initiated by other MACOMs or Army agencies.

GTRI proposes three objectives for implementation of Decision Support Systems at HQ FORSCOM.

1) Implement integrated DSS throughout the headquarters to provide application specific capabilities to action officers and senior management.

2) Provide for utilization of distributed databases within FORSCOM and the rest of the Army and DOD.

3) Initiate a long term strategy which provides for exporting FORSCOM developed DSS software to subordinate installations and other commands; and importing DSS developed outside of FORSCOM.

3.3.2 Recommended Alternatives Planning

The recommended alternatives for Strategic Planning are discussed with regard to the objectives from Section 3.1.1 and are organized accordingly. GTRI recommends these alternatives to the FORSCOM planning.

3.3.2.1 Alternatives for DSS Implementation

1) Write a Strategic Plan.

   This plan should include an assessment of the current state of Decision Support Systems and automation at Headquarters FORSCOM, an assessment of mission supporting technologies projected for the future, and an assessment of Army-wide automation efforts for compatibility.

2) Obtain Command Sponsorship.

   The FORSCOM Commander is the ultimate decision maker who must be supported by the FORSCOM DSS. He should be an integral part of the DSS planning process, and be constantly appraised of the implementation progress.

3) Use an Established DSS Development Methodology.

   Experience with implementation of Decision Support Systems has demonstrated that trying to plan and implement an all-encompasing DSS for an organization does not work. Information and decision support systems should not be developed like weapons systems. By the time all the requirements are captured and the design is agreed upon, the technologies and requirements upon which the DSS is based have changed and the system is doomed for expensive obsolescence. A less costly alternative with a proven success rate, is to incrementally develop software and expand the system as requirements and technology evolve. A local success story is the MICROFIX system built for FORSCOM J2 by GTRI. A Use-Learn-Develop design philosophy was adopted for that

program. It recognized that all system requirements cannot be easily specified at the beginning, in sufficient detail, for software development to be successful. This philosophy also provided system availability at an early stage of development. The developers were allowed to refine and add to the system as experience and specific requirements dictated.

A similar approach to the incremental and "Use-Learn-Develop" methodologies has been adopted by HQDA. This approach is summarized in the HQDA DSS Master Plan as follows:

> Our studies and our experience demonstrate that grandiose, highly centralized planning of decision systems--systems designed to be all things to all users--almost always fail. The "ink blot" approach, characterized by the use of a conceptual architecture, high level design, and an aggressive yet flexible development process, significantly increases the probability of success. Using this approach, components of the overall plan (the ink blots) can be developed rapidly and independently--consistent with the architecture and design for the whole. Over time, as more components are developed, new ink blots are added and/or earlier ink blots are expanded--extending DSS capabilities in an integrated manner. This concept is a keystone within the HQDA DSS vision. It is guidance by a proven template of success, cloning success from one system initiative to another. It requires a conceptual framework within which the "ink blots" can grow with assurance of ultimate integration.

The philosophies of "incremental development", "Use-Learn-Develop", and "Ink Blot" show a common theme that is recommended for DSS implementation in FORSCOM.

4) Organize a DSS Development Environment.

A system concept and DSS development environment will be needed to control system management and life cycle costs. It is conceivable that FORSCOM could have each DSS with different development languages, different user interfaces, different in-line documentation standards. This could create serious problems with management, maintenance, and life cycle cost.

GTRI recommends that FORSCOM specify responsibilities for a FORSCOM DSS development environment. FORSCOM has a unique mission and physical environment, and the organizational model appropriate to another agency, such as HQDA, should not be imposed on FORSCOM. A better approach would be to learn from the HQDA experience (and other agencies) and adopt applicable ideas and practices to the FORSCOM environment. The general recommendation is that each joint directorate within HQ FORSCOM be made responsible for the following:

- Define DSS requirements
- Plan DSS implementation
- Develop applications
- Monitor contracts
- Maintain applications' software
- Provide applications' software training

Any DSS applications generated at FORSCOM would be built in accordance with guidance provided by a designated office or function. That office would be responsible for ensuring the DSS development environment is established, and it will retain general functional responsibility. That office might include such things as:

- Plans and Architecture
- Systems Engineering
- Training
- Database Administration
- Development of Standards
- Contractor Guidances
- Systems Security
- Computer Operations

These functions are of course already being performed at FORSCOM. This plan does not suggest any organizational changes, rather it suggests an organizational focus that would provide a DSS development environment to achieve comparable capability with the HQDA DSS.

5) Set DSS Development Standards.

The FORSCOM DSS development environment will include the standards that control the software development process. A sample list of areas to provide guidance follows:

- User interface standards
- Documentation requirements and standards
- Configuration management standards and procedures
- Database management standards
- Systems security procedures
- Software development guidances
- Standard programming language(s)

6) Test the Environment by Building a DSS.

The DSS environment can best be demonstrated and tested by building a DSS in accordance with the guidance and direction developed under the previous recommendations. Two examples of specific candidates for DSS development with regard to the budget functions in FORSCOM are contained in Appendix A to this Study.

7) Implement Other DSS as Requirements are Generated and as Resources are Made Available.

A detailed grand plan for each DSS to be implemented at FORSCOM is not required. DSS can be implemented as functional DSS user requirements are formulated, and as time and funding permit. DSS requirements in the J8, for example, could flow to a candidate DSS description (similar to the examples in Appendix A). HQ Forces Comand Functions Manual (reference 10) could serve as a top level cross reference for structuring candidate DSS. Data flows and relations can be obtained using the Information Architecture Model, (reference 11) to provide design specific information. A process to follow for requirements definition and DSS design is contained in reference 5, Guide for DSS

Development. That document also contains helpful information regarding all aspects of DSS development.

3.3.2.2 Alternatives for Distributed Databases

A technological trend within industry and DOD is toward the use of distributed databases. Distributed databases allow for capturing the data at the source with single agency responsibility for updating and maintaining data. On-line or distributed access to the database at the source insures currency and prevents different versions of the same data from entering the decision process.

1) Implement distributed database with FORSCOM installations; two methods are available.

   - Distribute database - no duplication
     The installation becomes the sole possessor of the data. Any installation data required by HQ FORSCOM is done via remote query.

   - Distribute database - with duplication
     The installation is the proponent of the data, but HQ FORSCOM keeps a copy locally. The installation periodically updates HQ FORSCOM database. This allows HQ FORSCOM to view data and make decisions even if the installation computer or network link fails. The installation database is the master.

2) Piggyback other Army and DOD initiative for distributed databases.

   Set responsibility within FORSCOM to monitor outside initiatives for distributed databases. As these initiatives are successful in providing data of use to FORSCOM, implementation at FORSCOM should be initiated.

3) Utilize standard database interface.

Portability of applications software will be greatly enhanced by use of a standard database interface. The standard interface allows the application to address the supporting data through the interface without regard to the exact location or specifics of the underlying database. The application should be separated from the data via a standard interface.

SQL has become the defacto standard for much of the industry including HQDA. Use of SQL at the installations would facilitate movement of applications software.

4) Use PCs.

The use of PCs is not standard at the installations. Some installations use PCs as local workstation/terminals similar to the FIS, while other installations do not. Utilizing PCs and defining standard PC software (as done in the FIS) would allow easier transfer of software from HQ FORSCOM to installation. This includes contractor-developed software in addition to application tools developed by FIS or installation users. Using PCs as terminals also simplifies procurement, training and maintenance once existing terminals are be phased out.

3.3.2.3 Alternatives for Import/Export of Software

1) Standardize operating systems.

Even though the hardware at the installation level standardized on the IBM 43xx series computer, the operating systems in use cover the spectrum. The MVS, VM and DOS/VSE operating systems are scattered throughout the installations.

Standardization on a single operating system at the installation level would enable HQ FORSCOM and the installations to utilize virtually any

software developed for a single site. Distribution of data and electronic mail would be simpler. This standardization would be expensive to do at one time. Therefore doing it as part of the normal upgrade and replacement life-cycle would be the most effective method. Any installations changing operating systems would potentially lose applications that would not port to a new operating system. Therefore, careful consideration of individual cost/benefit is needed.

2) Set software standards.

FORSCOM should standardize the software in use throughout the FIS and the installations a much as possible. Common software at HQ FORSCOM and the installations would facilitate maintenance, data transfer and the training of users. This software would include individual DSS in addition to utilities such as Lotus 1-2-3. Standards should be flexible to prevent some sites from having to discard a large number of programs. FORSCOM has initiated some standardization at the HQ level by defining a standard set of software on the PC. This process should be continued at the installation level. When developing or purchasing software, insure that the FIS system tracks as much as possible with standards.

4.0 CONCLUSION

HQ FORSCOM can achieve comparable functionality with the DSS capabilities at HQDA by implementation of the near term and strategic planning guidance provided in this study. As those DSS capabilities are implemented, FORSCOM action officers and senior staff will be able to make faster and better decisions. These enhanced capabilities will dramatically improve decision support at FORSCOM and have a beneficial effect on all aspects of its mission.

The maximum immediate payoff for HQ FORSCOM with regard to Decision Support Systems will be to implement the recommendations from the near term plan. These are: baseline the mainframe, enhance application interactions of commercial software packages, enhance Sessions Manager for added functionality, expand

applications software, provide task-oriented training, and exercise marketing clout to influence commercial software modifications.

A strategic plan would provide a low cost road map for DSS implementation for FORSCOM and provide DSS connectivity with other Army agencies. The strategic plan should then be tested by building an initial DSS followed by other DSS as requirements evolve and funding is available.

Appendix A

FORSCOM DSS STUDY

Sample DSS for the FORSCOM Budget Process

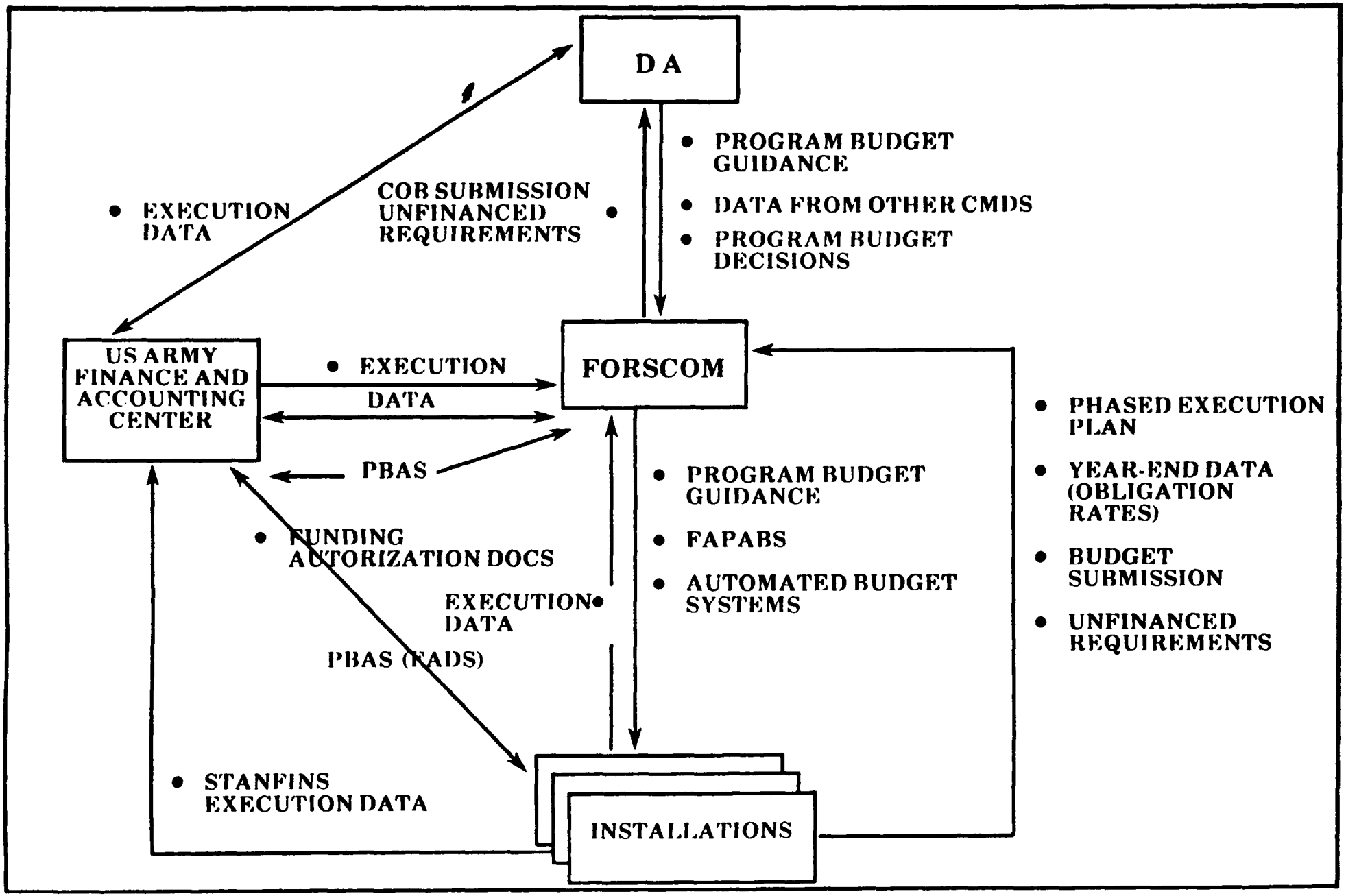
The budget process within the FORSCOM Resource Management Directorate served as the focal point for all detailed analysis conducted in the FORSCOM DSS Study. The rationale behind use of that specific function is contained in paragraph 1.1 of the study. This appendix provides a brief overview of the budget process and two sample decision support system descriptions specific to that process.

Figure A-1 depicts data and information flows affecting the FORSCOM budget process. Guidance and decision affecting the FORSCOM budget are input from DA. HQ FORSCOM in turn provides budget guidance to its subordinate installations. The installations provide HQ FORSCOM with actual budgets and execution plans. Funding authorization and execution data are handled through USAFAC who provides execution data back to HQ FORSCOM and DA. Excution data is also provided directly back to HQ FORSCOM by each funded installation. The heart of the system is the FAPABS as described in the FORSCOM Automated Program and Budget System (FAPABS) Functional Users Manual, Draft (reference 8).

Suggestions for system enhancements and functionality comparisons of the FAPABS to the BMIS system at HQDA ODCSLOG have been proposed by FORSCOM J8 personnel. Reference 7 contains functionality comparisons made by Mr. Bobby Bryant in a memorandum. Additional functionality comparisons and suggestions were made in Section 2.0 of the FORSCOM DSS Study.

In cooperation with FORSCOM J8 personnel additional ideas for decision support systems applicable to the FORSCOM budget process were discussed. Two of those ideas are described as candidate DSS and are included in this appendix as examples. These candidate DSS are referred to as modules in the description. A goal would be a total resource management system made up of several functional modules.

FORSCOM BUDGET PROCESS



TITLE: FORSCOM AUTOMATED PROGRAM BUDGET SYSTEM UPGRADE

DESCRIPTION: This module would "humanize" the current FAPABS system as it exists in the FORSCOM headquarters.

APPLICATION: The data in FAPABS contains programmed data for dollars and manpower for all appropriations managed by J8 and also sub-managed by the various program directors. For example, many of the Program 2 funds are managed by the J3 who is the proponent for operations. All resource managers need to be able to extract current dollar and manpower guidance from the command data base and to show this data using graphics packages.

INFORMATION NEEDED: Current program/budget data from Department of the Army is required as the baseline for the FAPABS database. This data is normally organized by showing direct dollar amounts by AMS and by MDEP (Management Decision Package) and by Issue Codes. Program Objective Memorandum data would be available for all out- years. Execution data from installations should be tied into the database to allow budget analysts to compare obligations against outlays between fiscal years. Unit Status Report data would be available and would be compared to the current funding available to the installation.

INFORMATION GENERATED: The system would generate spreadsheet reports showing how funds are distributed to the FORSCOM installations. Graphics would show fund breakout by appropriation and by major program and would allow immediate comparisons between installations. Major program managers would be able to make dollar distribution within this system (distribute or withhold). Mathematical formulas would calculate reductions in readiness based on reductions in funding. Managers would be able to analyze the adds and drops (audit trail) for changes in dollar and manpower amounts tied to a given MDEP.

DEVELOPMENTAL RISK:

TECHNICAL RISK: Medium risk.

DATA: The data is readily available across several standard Army systems. The comparison for funding versus the effort on readiness would be more difficult to

obtain. If the model used is perceived as inadequate by the users, it will fall in to immediate disuse.

DEVELOPMENTAL EFFORT: Medium risk based on the formula that would have to be developed in the readiness/funding comparison.

BENEFIT RISK: The data is available in several standard Army systems but is very difficult for action officers and decision makers to put together in one place. A Natural Language Interface package would make it much easier for an action officer to extract FAPABS data. The time saved would be considerable.

TITLE: FORSCOM AUTOMATED UNFINANCED REQUIREMENTS SYSTEMS

DESCRIPTION: This module will assist decision makers in determining what unfinanced requirements (UFRs) exist at the installation level and what the effect is when additional funding becomes available to satisfy these UFRs.

APPLICATION: This module could be used by the Director of Resource Management; his deputy; the Chief, Program Budget Division; the Chief, Active Component Branch, the Chief, Installation Analysts and his subordinate budget analysts, and Chief, Reserve Component Branch. The system could be made available to resource managers in each FORSCOM staff directorate and to the individual installations.

INFORMATION NEEDED: Required from the installation resource manager is the title of the UFR, the total dollar amount, installation priority assignment, the AMS (Army Management Structure) codes and MDEP (Management Decision Package) code where applicable, and an impact statement of at least 500 words length on the effect on mission performance if the UFR is not funded. This UFR system exists currently as a stand-alone PC-based system used by installations. The system produces dBase III database files which are aggregated at FORSCOM level. FORSCOM Program Budget Guidance is required. It is currently available only as a written document. Dollar guidance for total obligation authority is available to all FORSCOM Information System users through FAPABS.

INFORMATION GENERATED: The module would provide the decision makers at each level with the capability to list the unfinanced requirements for a given FORSCOM-funded installation and to obtain detailed information in the UFR. Installations would access the UFR system by modem and would enter the UFR information using a standard screen report format. This would allow installation resource managers to continually update their UFR lists. For example, a UFR can consist of several different AMS codes, and can show how the money in each AMS code would be spent by Element of Resource (EOR). The dollar information would then be used to determine the effect of additional funding when it is made available to the installation. The module would list for the decision maker which UFRs would be satisfied by priority with a given amount of money. The module would allow the

decision maker to "what if" the spread of additional funding across some or all of the FORSCOM-funded installations until an acceptable mix is obtained. The module could also provide to the decision maker a graphics capability showing total UFR amounts versus the amount of UFRs actually funded during the fiscal year.

DEVELOPMENTAL RISK: Low risk.

DATA: The data is already compiled in PC-based applications and would be easily adapted to a mainframe application.

DEVELOPMENTAL EFFORT: Low risk. The calculations used to arrive at decisions are very straightforward. It is simply balancing needs against available funding.

BENEFIT RISK: The data is currently available in a PC-based standalone application. It would save a great deal of time at the installation level because users would be able to enter UFRs directly into the corporate UFR database. The time spent developing and refining dBase III applications, particularly when changes occur in PC software, would be saved. The process used by installation analysts in obtaining the data from the standalone program requires them to wait on the processing to diskettes created for each installation analyst and this process is cumbersome and time - consuming. UFR data cannot be readily charted based on current information unless the data is taken from a printout and physically placed into a graphics package such as Microsoft Windows, Harvard Graphics, or Lotus Freelance. UFR data is not readily available to major decision makers except as printouts.

Appendix B
Bibliography

The following documents provided information used in the conduct of the FORSCOM DSS Study. These documents are in addition to the documents that were specifically referenced in the report from Section 1.3.

Government Documents

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